

3.6.10 WASTE MANAGEMENT

This section outlines the major environmental regulatory structure and ongoing waste management activities for ORR. A more detailed discussion of the ongoing waste management operations is provided in Section E.2.5. Tables 3.6.10-1 (Y-12), 3.6.10-2 (ORNL), and 3.6.10-3 (K-25) present a summary of waste management activities at ORR for 1994.

The Department is working with Federal and State regulatory authorities to address compliance and cleanup obligations arising from its past operations at ORR. DOE is engaged in several activities to bring its operations into full regulatory compliance. These activities are set forth in negotiated agreements that contain schedules for achieving compliance with applicable requirements, and financial penalties for nonachievement of agreed-upon milestones.

The EPA placed ORR on the NPL on November 21, 1989. DOE, EPA Region IV, and the TDEC completed a Federal Facility Agreement effective January 1, 1992. This agreement coordinates ORR inactive site assessment and remedial action. Portions of the Federal Facility Agreement are applicable to operating waste management systems. Existing actions are conducted under RCRA and applicable State laws, which minimize duplication, expedite response actions, and achieve a comprehensive remediation of the site. ORR generates and manages spent nuclear fuel and the following waste categories: TRU, low-level, mixed, hazardous, and nonhazardous. A discussion of the waste management operations associated with each of these categories follows.

Spent Nuclear Fuel. The ORR generates and manages a relatively small quantity of spent nuclear fuel. The only operating reactor is the ORNL High-Flux Isotope Reactor, which is used to produce isotopes for medical and industrial applications, neutron scattering experiments, and various materials irradiation experiments. ORR has also received some offsite shipments of reactor irradiated nuclear material. Most of the fuel and irradiated nuclear material is stored in numerous buildings and hot cells at ORNL and one building at Y-12. Some of the fuel still remains in the core of the inactive research reactors. Irradiated fuel and its associated fission products are stored in dry wells at ORNL in Solid Waste Storage Area-5N. A small amount of irradiated spent nuclear fuel is stored in wells and trenches in Solid Waste Storage Areas-5S and -6. The interim management of the spent nuclear fuel will be in accordance with the ROD published in the *Federal Register* (60 FR 28680) on June 1, 1995, for the *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* (DOE/EIS-0203-F) as amended on March 8, 1996 (61 FR 9441).

High-Level Waste. The ORR does not generate or manage HLW.

Transuranic Waste. The ORNL is the only generator of TRU waste at ORR. Solid TRU waste consisting of filters, paper, metals, and other items was generated at ORNL through laboratory, pilot plant, and reactor operations. This includes both contact-handled and remote-handled TRU waste contaminated with lead and, in some cases, mercury. Contact-handled waste is TRU waste that contains mainly Pu, which emits alpha particles and low-energy photons. The packaging is designed to provide sufficient containment and shielding to minimize personnel exposure. Remote-handled TRU waste contains activation materials and fission products that decay and emit beta and gamma radiation on the surface of the packaging that exceeds 200 mrem/hr.

As of December 31, 1994, approximately 1,360 m³ (1,790 yd³) of TRU wastes were in retrievable drum storage. The amount of remote-handled waste was about 1,420 m³ (1,860 yd³) (OR LMES 1996a:4-4b). Current activities center around certification of contact-handled waste, planning/designing of a repackaging and certification facility for remote-handled wastes, and planning for shipment of wastes to a suitable repository that can provide for the disposal of TRU wastes.

Low-Level Waste. Solid LLW, consisting primarily of radioactively-contaminated construction debris, wood, paper, asbestos, trapping media, personnel protection equipment, process equipment, and radioactive materials

Table 3.6.10-J. Spent Nuclear Fuel and Waste Management Activities at Oak Ridge Reservation, Y-12 Plant

Category	1994 Generation (m ³)	Treatment Method	Treatment Capacity (m ³ /yr)	Storage Method	Storage Capacity (m ³)	Disposal Method	Disposal Capacity (m ³)
Spent Nuclear Fuel	None	NA	NA	Storage vaults ^a	4 ^b	None—Ship to INEL or SRS	NA
Low-Level Fuel							
Liquid	898	Activated sludge	12,900 ^c	Stored onsite	Included in liquid mixed LLW	NA	NA
Solid	5,230 ^d	Stabilization and compaction, incineration and smelting by commercial vendor	19,300 ^e	Stored onsite at Y-12 or K-25	16,200 ^f	None—stored pending availability of offsite disposal or planned onsite LLW disposal facilities	NA
Mixed Low-Level							
Liquid	1,390	Neutralization, activated sludge, oxidation, adsorption, and incineration at K-25	12,300 ^g	Tanks and drums	2,660 ^h	NA	NA
Solid	306	Incineration at K-25 or offsite commercial vendors	NA	Staged for shipment	11,700 ⁱ	Offsite	NA
Hazardous							
Liquid	9,450	Managed as mixed LLW	30,300 ^j	Tanks	751 ^k	Offsite	NA
Solid	Included in hazardous liquid ^l	None	NA	Staged for shipment	170 ^m	Offsite	NA
Nonhazardous (Sanitary)							
Liquid	2,460 m ³ /day ⁿ	Offsite ^o	5,300 m ³ /day	None	NA	Offsite Industrial and Sanitary Landfill	NA
Solid	41,700 ^p	Compaction	41,700 ^q	None	NA	V, offsite at municipal site	1,100,000 ^r

Table 3.6.10-I. Spent Nuclear Fuel and Waste Management Activities at Oak Ridge Reservation, Y-12 Plant—Continued

Category	1994 Generation (m ³)	Treatment Method	Treatment Capacity (m ³ /yr)	Storage Method	Storage Capacity (m ³)	Disposal Method	Disposal Capacity (m ³)
Nonhazardous (Other)							
Liquid	228,000 ^s	Evaporation, neutralization, and precipitation	251,000 ^t	None	NA	Offsite-NPDES outfall	NA
Solid	Included in solid sanitary	None	NA	None	NA	Construction Demolition Landfill VI	119,000 ^r

^a Building 9720-5.^b Based on conversion factor of 52 kg/m³(DOE 1995kk). [Text deleted.]^c West End Treatment Facility and Central Pollution Control Facility.^d Includes 2,500 m³ of contaminated scrap metal.^e Waste Feed Preparation Facility and the Uranium Chip Oxidizer Facility (design feed rate).^f Includes the Depleted Uranium Oxide Storage Vaults, Above Grade Storage Facility, salvage yard, Sludge Basin and the Containerized Waste Storage Area.^g Includes Waste Coolant Processing Facility, Acid Waste Neutralization and Recovery Facility, Cyanide Treatment Facility, and Groundwater Treatment Facility. The West End Treatment Facility, the Plating Rinsewater Treatment Facility, and the Central Pollution Control Facility can process mixed waste and LLW.^h OD7, OD8, OD9, and OD10, Liquid Storage Facility, 9212 Tank Farm, and Building 9720-9 (western half).ⁱ RCRA and PCB Container Storage Facility (Bldg. 9720-58), Container Storage Facility (Bldg. 9720-12), PCB Drum Storage Facility (9404-7), Buildings (9201-4, 9206, and 9212), and the West End Tank Farm.^j Plating Rinsewater Treatment Facility and Stream Plant Wastewater Treatment Facility.^k Building 9720-9 (eastern half).^l Currently, all RCRA-hazardous wastes are stored at the Y-12 plant or the K-25 Site awaiting further disposal.
^m RCRA Storage and Staging Area (Bldg. 9720-31).ⁿ Storm runoff does not include sewage waste.^o Oak Ridge Sewage Treatment Plant.^p Includes trash, debris, scrap metal, treatment residue, and classified waste.^q The 1994 generation rate was used as an estimate for the capacity of the Building 9720-25 Baler Facility.^r Serves all three sites. Value provided is design capacity. Projected utilization is 39,600 m³/yr for Industrial and Sanitary Landfill V and 27,500 m³/yr for Construction Demolition Landfill VI.^s Includes industrial wastes such as oils and solvents, liquid waste and wastewater from Y-12 Plant operations, contractors and waste management.^t Approximate Central Pollution Control Facility, West End Treatment Facility, and Steam Plant Wastewater Treatment Facility NPDES permit annual discharge volume limits for East Fork Poplar Creek.

Note: NA=not applicable.

Source: DOE 1994d; DOE 1994n; DOE 1995gg; DOE 1995kk; OR DOE 1992c; OR DOE 1995g; OR MMES 1996a; OR MMES 1995c; ORR 1993a.4.

Table 3.6.10-2. Spent Nuclear Fuel and Waste Management Activities at Oak Ridge National Laboratory

Category	1994 Generation (m ³) ^a	Treatment Method	Treatment Capacity (m ³ /yr)	Storage Method	Storage Capacity (m ³)	Disposal Method	Disposal Capacity (m ³)
Spent Nuclear Fuel							
Transuranic (Solid)							
Contact handled	103 ^c	None	NA	Staged for shipment ^d	1,760	None, WIPP or alternate facility in future	NA
Remote handled	64	None	NA	Staged for shipment ^e	856	None, WIPP or alternate facility in future	NA
Low-Level Liquid	2,070	Ion exchange, filtration, evaporation, and solidification	390,000 ^f	Stored onsite in tanks	3,230 ^g	NA	NA
Solid	1,640 ^h	Compaction (compaction, incineration and smelting by commercial vendor)	11,300 ⁱ	Stored onsite	7,850 ^j	Onsite	3,590 ^k
Mixed Low-Level Liquid		Included in solid mixed LLW ^l	Incineration at K-25	Offsite	Tank and drums	393 ^m	None
Solid	92 ⁿ	Incineration at K-25 or offsite commercial vendors	Offsite	Staged for shipment	Include in liquid mixed LLW	Offsite	NA
Hazardous Liquid	23,800 ^o	Neutralization/ sedimentation and evaporation, treat offsite ^p	Included in nonhazardous (other) liquid capacity Variable	Staged for shipment	Included in solid hazardous	Offsite	NA
Solid	55 ^p	Open-burning ^q , treat offsite	Staged for shipment			130 ^r	Storage/incineration (K-25) and landfill (Y-12)

Table 3.6.10-2. Spent Nuclear Fuel and Waste Management Activities at Oak Ridge National Laboratory—Continued

Category	1994 Generation (m ³)	Treatment Method	Treatment Capacity (m ³ /yr)	Storage Method	Storage Capacity (m ³)	Disposal Method	Disposal Capacity (m ³)
Nonhazardous (Sanitary)							
Liquid	360,000	Extended aeration-activated sludge treatment	414,000 ^s	None	NA	NPDES outfall	NA
Solid	4,820	None ^t	NA	None	NA	Y-12 landfill, offsite to municipal site	See Table 3.6.10-1
Nonhazardous (Other)							
Liquid	718,000 ^u	Neutralization, precipitation, and filtration	1,510,000 ^v	None	NA	Offsite	NA
Solid	Included in solid sanitary	None	NA	None	NA	Y-12 landfill and SWSA 6 burial	Included in sanitary

^a The HFIR research reactor generates 12 fuel assemblies per year (9.4 kg U-235 per assembly). Based on conversion factor of 52 kg/m³ (DOE 1995kk).^b Includes 820 kg of available spent fuel capacity at the HFIR pool (43% full). Reracking of positions under way. Based on conversion factor of 52 kg/m³, and the size of all fuel elements is assumed to be the same (DOE 1995kk).^c Does not include 8 m³ of mixed TRU waste.^d Stored in various buildings (Bldg. 7826, 7834, 7842, 7878, 7879, and 7934).^e Stored in tanks, bunkers, and earthen trenches (Bldg. 7855 and SWSA 5N trenches).^f Process Waste Treatment Plant, Melton Valley Low-Level Waste Immobilization Facility and Liquid Low-Level Waste Evaporation Facility.^g Liquid LLW System.^h Includes radioactive scrap metal.ⁱ Waste Compaction Facility (Bldg. 7831).^j As of June 30, 1995.^k Interim Waste Management Facility.^l May include 19 m³ of mixed waste oil treated at TSCA incinerator in 1994.^m Buildings 7654, 7507W, 7823 and Tank 7830a.ⁿ Includes waste oils, organic wastes, carcinogenic wastes, mercury-contaminated solid wastes, solvents, corrosives, poisons, and other process wastes.^o Projected Steam Plant regenerate in 1994 (may be coal yard runoff).^p Includes PCB and asbestos. May include some liquid hazardous waste.^q The Chemical Detonation Facility treats small amounts of hazardous waste that would be dangerous to transport offsite. Explosives such as aged picric acid are detonated in this facility.^r Hazardous Waste Storage Facility (Bldg. 7652 Part B permit - 57,200 l and Bldg. 7507 Part A permit - 31,200 l), and Buildings 7651 and 7653.^s Sanitary Waste Water Treatment Facility design capacity.^t Loaded in boxes and stored at Interim Waste Management Facility.^u May include coal yard runoff which is hazardous waste.^v Nonradioactive Wastewater Treatment Facility.

Note: NA=not applicable.

Source: DOE 1993; DOE 1994d; DOE 1994n; DOE 1995gg; DOE 1995kk; OR DOE 1993b; OR MMES 1996a; OR MMES 1995c.

Table 3.6.10-3. Waste Management Activities at Oak Ridge Reservation, K-25 Site

Category	1994 Generation (m ³)	Treatment Method	Treatment Capacity (m ³ /yr)	Storage Method	Storage Capacity (m ³)	Disposal Method	Disposal Capacity (m ³ /yr)
Low-Level							
Liquid	55	Incineration	15,700 ^a	Stored onsite	Included in solid LLW ^b	NA	NA
Solid	4,480 ^c	Compaction/ incineration and smelting by commercial vendor	Offsite	Stored onsite	44,000 ^d	None-stored pending availability of offsite disposal or planned onsite LLW disposal facilities	NA
Mixed Low-Level							
Liquid	148,000 ^e	Neutralization and incineration	221,000 ^f	Stored onsite	97,000 ^g	NA	NA
Solid	222 ^h	Incineration or offsite by commercial vendors	Offsite ⁱ	Stored onsite	120,000 ^j	Offsite	1,130 ^k
Hazardous							
Liquid	Included in liquid mixed low-level ^l	Treated as mixed LLW	Included in liquid mixed LLW	Treated as mixed LLW	Included in liquid mixed LLW	Offsite	NA
Solid	743 ^m	Treated as mixed LLW	Offsite ⁿ	Treated as mixed LLW	Included in solid mixed LLW	Offsite	NA
Nonhazardous (Sanitary)							
Liquid	416,000	Extended aeration	829,000 - sewage ^o	None	NA	NPDES outfall	NA
Solid	2,950 ^p	None	NA	None	NA	Oak Ridge landfill (offsite)	NA

Table 3.6.10-3. Waste Management Activities at Oak Ridge Reservation, K-25 Site—Continued

Category	1994 Generation (m ³)	Treatment Method	Treatment Capacity (m ³ /yr)	Storage Method	Storage Capacity (m ³)	Disposal Method	Disposal Capacity (m ³ /yr)
Nonhazardous							
(Other)							
Liquid	69,300 ^q	Neutralization settling; and filtration	221,000 ^r	None	NA	NPDES outfall	NA
Solid	Included in solid sanitary	None	NA	Stockpiled at scrap yard	Unspecified capacity	Y-12 landfill and metal sold to public	See Table 3.6.10-1

^a TSCA Incinerator (K-1435). Also treats mixed waste.^b Liquid LLW stored in Building K-25 vaults.^c Includes 103 m³ of contaminated scrap metal.^d Based on solid LLW stored in Building K-25, outside areas, K-1313A, and K-33.^e Includes TSCA waste waters and density assumption is equal to 1 kg/l.^f Central Neutralization Facility permitted operating capacity.^g Includes current permitted container (solid/sludges/liquid wastes) and tank (liquids) storage capacity.^h Includes contaminated asbestos/beryllium oxide (BeO), RCRA and state regulated waste, and may include some PCB-tainted waste.ⁱ Sludge Fixation Facility may be used after engineering problems are solved.^j Total current permitted waste pile unit storage capacity.^k Waste sent to commercial vendor in 1994.^l Hydrogen soffener blowdown from the steam plant.^m Managed as mixed waste.ⁿ Sludge Fixation Facility may be used after engineering problems are solved^o Sewage treatment plant capacity (Bldg. K-1203).^p Includes waste shipped to Y-12 Sanitary Landfill.^q Includes nonhazardous Steam Plant waste water.^r Central Neutralization Facility permitted capacity.

Note: NA=not applicable.

Source: DOE 1995gg; OR DOE 1993a; OR LMES 1996a; ORR 1993a:4.

removed from liquid and airborne discharges, is generated at ORR. ORNL operates the only LLW disposal facility at ORR. This disposal facility only accepts LLW generated at ORNL. Solid LLW is being stored at K-25 and Y-12 for future disposal. Contaminated scrap metal is stored above ground at the K-770 scrap metal facility and the Y-12 old salvage yard until further disposal methods are evaluated.

The management of LLW at ORR has been affected by three recent events: declines in ORR disposal capacity, changes in regulatory and operational conditions, and evolution of the radioactive waste disposal-class concept. The previous strategy classified LLW according to its isotopic content, concentration, and the performance of a disposal facility. In some instances, these classifications are used to describe the type of LLW or a disposal technology. For example, L-I refers to low concentration LLW or a landfill disposal facility, while L-II refers to low to moderate concentration LLW or a tumulus disposal facility. A revised classification system has been proposed. Exempt LLW would have contaminant levels sufficiently low to be disposed of in a sanitary or industrial landfill with State concurrence. Disposable LLW would be suitable for disposal on the ORR as determined by facility performance assessments. Offsite LLW would be that LLW which would not meet the criteria of exempt or disposable. The long-range strategy is to rely on the combination of onsite and offsite facilities. Plans for a replacement onsite disposal facility will continue to be pursued with the most likely candidate site for a tumulus disposal facility being Bear Creek Valley. That portion of the LLW that cannot be disposed of onsite consistent with DOE Order 5820.2A, *Radioactive Waste Management*, will be stored until disposal offsite becomes available.

Mixed Low-Level Waste. The RCRA mixed, radioactive land disposal restricted waste is in storage at Y-12, K-25, and ORNL. Because prolonged storage of these wastes exceeded the one-year limit imposed by RCRA, ORR entered into a Federal Facility Compliance Agreement (FFCA) for RCRA Land Disposal Restriction wastes with EPA on June 12, 1992. This agreement was terminated with issuance of the TDEC Commissioner's Order, effective October 1, 1995, which requires DOE to comply with the Site Treatment Plan prepared by ORR. The plan contains milestones and target dates for DOE to characterize and treat its inventory of mixed wastes at ORR.

Sludges contaminated with low-level radioactivity are generated by settling and scrubbing operations, and in the past were stored in K-1407-B and 1407-C ponds at K-25. Sludges have been removed from these ponds and a portion has been fixed in concrete at the K-1419 Sludge Treatment Facility and stored at the K-33 Building. The concreted sludges are being shipped offsite for disposal. The raw sludges are stored in the K-1065 building pending further treatment. Mixed waste sludges are also generated at Y-12 in the treatment of nitrate waste from purification and recycling of uranium and in the treatment of plating shop waste.

The primary facility generator of liquid mixed waste is the K-1435 TSCA Incinerator from the wet scrubber blowdown. This waste is currently being treated at the Central Neutralization Facility, which provides pH adjustment and chemical precipitation. Treated effluents are discharged through an NPDES outfall. The contaminated sludges are stored at K-25 as mixed waste.

The K-25 TSCA incinerator has a design capacity to incinerate 909 kg/hr (2,000 lb/hr) of mixed liquid waste and up to 455 kg/hr (1,000 lb/hr) of solids and sludge (91 kg/hr [200 lb/hr] maximum sludge content) (ORR 1993a:2). The TSCA incinerator is capable of incineration of both TSCA- and RCRA-mixed wastes. DOE guidance currently does not allow incineration of solids/sludges. Because of permit limits (TSCA, RCRA, State of Tennessee), the incinerator is not running at full capacity. In 1994, approximately 2,590 m³ (683,000 gals) of mixed liquid waste was incinerated (OR LMES 1996a:7-6).

Uranium wastes contaminated with PCBs (that is, mixed wastes) are being stored in excess of the 1-year limit imposed by TSCA because of the lack of treatment and disposal capacities. DOE and EPA have signed an FFCA, effective February 20, 1992, to bring K-25 associated with the Uranium Enrichment Program into compliance with TSCA regulations for use, storage, and disposal of PCBs. It also addressed the approximately 10,000 pieces of nonradioactive PCB-containing dielectric equipment associated with the shutdown of diffusion

plant operations. An additional FFCA related to TSCA compliance is currently being discussed by DOE and EPA for ORR.

Hazardous Waste. The RCRA-regulated waste are generated by ORR in laboratory research, electroplating operations, painting operations, descaling, demineralizer regeneration, and photographic processes. Certain other wastes (for example, spent photographic processing solutions) are processed onsite into a nonhazardous state. Those wastes that are safe to transport and have been certified as having no radioactivity added are shipped offsite to RCRA-permitted commercial treatment and disposal facilities. Small amounts of reactive chemical explosives that would be dangerous to transport offsite, such as aged picric acid, are processed onsite in the Chemical Detonation Facility at ORNL.

Nonhazardous Waste. Nonhazardous wastes are generated from ORR maintenance and utilities. For example, the steam plant produces nonhazardous sludge. Scrap metals are discarded from maintenance and renovation activities and are recycled when appropriate. Construction and demolition projects also produce nonhazardous industrial wastes. All nonradioactive medical wastes are autoclaved to render them noninfectious and are sent to the Y-12 Sanitary Landfill. Remedial action projects also produce wastes requiring proper management. The State of Tennessee permitted landfill (Construction Demolition Landfill VI) receives nonhazardous industrial materials such as fly ash and construction debris. Asbestos and general refuse are managed in Industrial and Sanitary Landfill V located at Y-12.